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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CONTINUATION-IN-PART APPLICATION FOR UTILITY PATENT

Title: **TRAVELING COVER BENCH SYSTEM WITH HYDRAULIC FLUID ACTUATOR**

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RELATED APPLICATIONS

This Application is a Continuation-In-Part utility patent application related to U.S. Patent Application Serial No. 09/829,801, filed April 25, 2002, entitled AUTOMATIC POOL COVER SYSTEM USING BUOYANT-SLAT POOL COVERS, which is incorporated herein by reference in its entirety, and claims any and all benefits to which it is entitled therefrom. This Application is also related to U.S. Provisional Patent Application Serial No. 60/440,667 filed January 15, 2003 entitled APPARATUS AND METHOD FOR OPENING AND CLOSING A POOL COVER DRIVE CHAMBER, which is incorporated herein by reference in its entirety, and claims any and all benefits to which it is entitled therefrom.

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FIELD OF THE INVENTION

The present invention relates generally to an automatic swimming pool cover system, and in particular, to a pool cover drum enclosure located at the end of a swimming pool which can be automatically moved away from the side of the pool upon removal of the pool cover.

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BACKGROUND OF THE INVENTION

Automatic pool cover systems utilizing interconnected rigid buoyant slats, which roll up on a submerged or elevated drum as described by U.S. Pat. No. 3,613,126, to R. Granderath, are popular in Europe. These pool cover systems utilize passive forces arising from buoyancy or gravity for propelling the cover to extend the cover across a pool. With either buoyancy or gravity, there must be some mechanism to prevent a retracted cover from unwinding responsive to the passive force. Such passive force systems also have a disadvantage in that the passive force must be overcome during retraction. Granderath suggests a worm gear drive mechanism for winding the cover and preventing cover drum rotation when not powered. The slats for these are further described in U.S. Pat. No. 4,577,352, to Gautheron.

U.S. Pat. No. 4,411,031 to Stolar describes a system similar to Granderath where instead of rigid hinged buoyant slats, various floating sheet materials such as a polyethylene polybubble, or a laminate of vinyl sheeting and foamed substrate, are floated on the surface of the water. The propulsion of the cover across the pool is reliant on buoyant and gravitational forces much like the system in the Granderath patent.

Pool covers which employ floating slats or similar materials, and which use buoyant forces to propel the cover across the pool, necessarily wind the cover onto a roller drum which is positioned above or below the water surface. In the case of covers wound onto a spool sitting above the edge of the pool, such as at one end or another, when the cover is fully wound onto the cover drum, the entire rolled up cover sits above the surface of the edge of the pool. In some cases, the cover and drum are located in a separate bench apparatus setting next to the pool. The design is to aesthetically hide the cover and roller drum and also allow the entire mechanism to be manually rolled backwards away from the end of the swimming pool.

Using a separated gear drive system with limit switches to travel such a limited distance is costly and it complicates timing of the two drive systems. Furthermore, these electric drives require the supply of electrical current right next to the swimming pool which poses the possibility of a shock safety hazard. Moreover, having the electrical apparatus near the pool accelerates corrosion of the electrical components, rendering them unreliable, as well as exposing the components to flooding and costly repair.

Bench systems

Floating cover system, both the slatted type and also the floating fabric type are also installed and used on existing swimming pools. Typically these systems have their wind-up roll system enclosed by a bench. Since these covers often float on the water surface, or are stretched across the surface and attach in sliding grooves or tracks located along the length or width of the pools, a bench must be positioned at the pool edge, often partially hanging over the pool water surface. This design is to accommodate cover slats or floating fabric deployed from the cover drum as it is placed directly onto the pool water surface, or to allow retraction of the cover and winding of the cover onto an elongated, central spool shaft. This is a poor design because since part of the pool cover bench remains positioned directly adjacent or even partially above part of the pool. Often, swimmers might inadvertently bump their heads or arms on the enclosure bench, and in many commercial and public applications this is a disadvantage.

Another problem with the fixed bench installation or roller stand right next to the pool edge is that it prevents access to that pool side such as for ingress or egress to the pool, or for location of diving boards or platforms. Typically these installations overhang the edge of the pool, so that when the pool cover unwinds, it drops directly onto the surface of the water and floats out over the surface. the fixed installation is a safety hazard and inconvenience for swimmers turning or stopping for rest. Hence various means are employed to move these benches, either manually and preferably automatically away from the pool once the cover has been removed from the pool and wound up onto the cover roller

contained within the bench or other suitable cover housing.

In the case of auxiliary mechanism such as bench enclosures, or automatic lids at the pool bottom or pool wall side, these also must be powered and controlled by a separate electric gear drive system and controls. Furthermore the correct sequencing or control of these auxiliary bench or lid mechanisms can become fairly complex, unreliable and service prone.

As described in several other applications and patents by the inventor, automatic cover drive systems have to be mounted next to the swimming pool and frequently below the pool deck surface. With the exception of hydraulic drive systems as described on of the inventor's prior US Patent 5,327,590 and applications, most floating and slatted cover systems use electric drive systems. This is a potential shock hazard near the pool surface area and furthermore, when these systems are even briefly submerged, or flooded, expensive damage and repair costs are entailed.

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ADVANTAGES AND SUMMARY OF THE INVENTION

The present invention comprises a hydraulic or pneumatic cylinder actuator to the auxiliary lid cover mechanisms and furthermore simplifies these mechanisms and their controls by having them powered by means of a single physically remote power pack or electric fluid pump. The complete system hydraulics near the pool are supplied with only two hydraulic interchangeable supply and return lines to the physically remote power pack or electric fluid pump.

The proposed invention incorporates a standard hydraulic or pneumatic cylinder, where the full travel of the cylinder is sized to the arc of travel of the lever arm acting to move the pool floor lid system from the closed to the operational open position and uses the mechanical end travel of the cylinder and the consequent pressure surge to actuate a pressure switch and/or various sequencing valve means to actuate other components of the system in a timed and sequenced and velocity controlled manner.

The present invention is related to outdoor pools where the cover system is suspended in a rolled up spool fashion on top of a superstructure adjacent to the pool.

The distinct advantage of the hydraulic or pneumatic cylinder means is that the end stop actuation or travel limiting means is now accomplished by utilizing the immediate fluid pressure surge or increase as the cylinder reaches its mechanical end of travel, and combining or utilizing this with a remote electro-hydraulic pressure switch at the remote power pack to either stop the power pack pump, or by means of a sequencing valve or a combination thereof, to advance to subsequent step in the pool cover operation and final operation of the steps needed to operate the complete system.

Another advantage of using hydraulics or air is that the speed of the cylinder and consequently the linear velocity of the lid operation can be easily and simply controlled by a pressure valve and by

timed fluid flow diversion, all using components that are not affected by being near moisture or compromising the safety of swimmers with the potential electric shock hazard.

Another advantage of using hydraulics or air means is that the speed of the cover drive tube can be easily temporarily slowed by using a valve connected to, and actuated through a timing device to bleed off part of the flow to die reservoir or tank, thereby slowing the cover drive tube, and hence, the overall speed of the moving bench enclosure.

It is yet a further object and advantage of the present invention to provide a traveling cover enclosure which slides out over the edge of the pool such that the cover drum is able to unwind the pool cover directly over the surface of the water, adjacent the edge of the pool and which would float out over the surface of the entire pool, as desired, and which can be slid backward away from the edge of the swimming pool once the cover is removed and fully wound up onto the cover drum, thereby removing a potential safety hazard, i.e., the overhanging cover drum at the end of the pool, providing a swimming pool with all ends which can be used safely by swimmers and all others and a traveling cover enclosure which can be relocated away from the edge of the pool essentially as far away as desired.

Further objects and advantages of the present invention will be come apparent through the following descriptions, and will be included and incorporated herein.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1A is a representative plan view of a preferred embodiment of the present invention showing the location and movement of the automatic cover enclosure bench system **104** adjacent the swimming pool **102**.

FIG.1B is a representative plan view of a preferred embodiment of the present invention, such as shown in FIG. 1A, showing the location and movement of the automatic cover enclosure bench system **104** advanced beyond the edge of the swimming pool **102**.

FIG.1C is a representative cross section view of a preferred embodiment of the present invention, such as shown in FIG. 1A, showing the location and movement of the automatic cover enclosure bench system **104** advanced beyond the swimming pool **102**.

FIG. 2 is a representative schematic diagram showing a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention.

FIG. 3 is a representative exploded view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention.

FIG. 4 is a representative right side view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention.

FIG. 5 is a representative left side view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention with the top panel **408** removed.

FIG. 6 is a representative right detail side view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The description that follows is presented to enable one skilled in the art to make and use the present invention, and is provided in the context of a particular application and its requirements. Various modifications to the disclosed embodiments will be apparent to those skilled in the art, and the general principals discussed below may be applied to other embodiments and applications without departing from the scope and spirit of the invention. Therefore, the invention is not intended to be limited to the embodiments disclosed, but the invention is to be given the largest possible scope which is consistent with the principals and features described herein.

It will be understood that in the event parts of different embodiments have similar functions or uses, they may have been given similar or identical reference numerals and descriptions. It will be understood that such duplication of reference numerals is intended solely for efficiency and ease of understanding the present invention, and are not to be construed as limiting in any way, or as implying that the various embodiments themselves are identical. Unless specifically indicated otherwise, all amounts given in the text and the examples which follow are understood to be modified by the term "about," and those figures expressed in terms of percent (%) are understood to refer to weight percent, unless indicated otherwise.

FIG.1A is a representative plan view of a preferred embodiment of the present invention showing the location and movement of the automatic cover enclosure bench system **104** adjacent the swimming pool **102**. FIG.1B is a representative plan view of a preferred embodiment of the present invention, such as shown in FIG. 1A, showing the location and movement of the automatic cover enclosure bench system **104** advanced beyond the edge of the swimming pool **102**. FIG.1C is a representative cross section view of a preferred embodiment of the present invention, such as shown in FIG. 1A, showing the location and movement of the automatic cover enclosure bench system **104** advanced beyond the swimming pool **102**.

As shown best in FIG. 1A,, the automatic cover enclosure bench system **104** is located outside the swimming pool **102**, such as on an edge, at one end or on one side As shown in FIGS. 1B and 1C, movement of this configuration of the bench **104** is lengthwise with regard to the length of the swimming pool **102**. The orientation of movement of the automatic cover enclosure bench system **104** can be modified according to the shape of the swimming pool**102**.

The automatic cover enclosure bench system **104** is located completely outside the swimming pool **102** and is free to travel independent thereof. There is a usable area **112** between the edge of the swimming pool **102** and the automatic cover enclosure bench system **104**. This ensures the system **104** is not submerged in water and can be moved towards a point **114** away from the edge of the pool **102**, to eliminate a potential electric shock, a safety hazard. It will be understood that the bench **104** can be moved as far away to point **114** as desired, however modifications in the design of this invention will be required when moving the bench **104** greater than about 18-36 inches, or more or less, away from the edge **112** of the pool.

As shown in FIGS. 1B and 1C, when in operation opening or closing the pool cover **101**, the traveling cover enclosure **104** is able slides out over the edge **112** of the pool **102** such that the cover drum **502** is able to unwind the pool cover **101** directly over the surface of the water. The actual enclosure **104** is adjacent or beyond the edge **112** of the pool **102**. As it unwinds, the pool cover **101** floats out over the surface of the water over the entire pool **102**, as desired. Then, after the cover **101** is removed and fully wound up onto the cover drum **502**, the entire enclosure **104** is slid backward away from the edge **112** of the swimming pool **102**,, such as shown in FIG. 1A, thereby removing a potential safety hazard, i.e., the overhanging cover drum at the end of the pool **102**. This provides a swimming pool with both ends which can be used safely by swimmers for turning, stopping and resting, etc., and all

others. As will be understood, thee traveling cover enclosure **104** which can be relocated away from the edge **112** of the pool **102** essentially as far away as desired.

FIG. 2 is a representative schematic diagram showing a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention.. The whole system is powered by a physically remote power pack pump **202** that supplies the complete system hydraulics via a two hydraulic interchangeable supply and return lines **212**. The hydraulic power moves the cylinder piston **206** and the action of the cylinder **206** subsequently move the overall automatic cover enclosure bench system **104** within the range of the restricted travel distance **108**. The control system **104** comprises a cylinder **206**, in which the action of the cylinder **206** is used to automatically cause lateral movement of the automatic cover enclosure bench system **104** within the restricted travel distance **108**.

FIG. 3 is a representative exploded view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention. FIG. 4 is a representative right side view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention. FIG. 5 is a representative left side view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention. FIG. 6 is a representative right detail side view of a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention.

The present invention is also a method of moving or sliding a bench **104** housing a pool cover **101** drive roller or drum. The system is powered by a hydraulic motor with the limited travel distance **108** restricted at both ends by the limit switch device. Tracks **302** and **304** constrain the travel of concave wheel surfaces of wheels **306**, **308**, **310** and **312**, respectively. Gear sprockets **326** and **324**, having a slightly smaller diameter so as not to interfere with the wheels' **310** and **312** motion on the track **302** and **304**, are attached to wheels **310** and **312**, respectively. The diameter of wheels **310** and **312** is at a preset

ratio to the length of travel of cylinder **206** so as to achieve the proper distance of travel **108** of the bench **104**. Disposed around the circumference of the gear sprockets **326** and **324** are section of the drive chain **334** and **332**. The drive chains **334** and **332** are designed to be sufficiently long to achieve the required travel. The ends of the drive chain **334** and **332** are suitably attached to cable portions **342** and **344**, as shown.

When pressure is applied through port **358** of cylinder **206**, cylinder rod **356** will travel inward or retract. The movement causes cable portion **352**, which is attached to a constrained attachment and subsequently to the end of the cylinder rod **354**, to move in the direction of arrow AA shown in Fig. 2. It will then pull chain **334**, which is attached the cable **340,** in a vertically upward direction. The movement will subsequently cause gear sprocket **326** to rotate in the counterclockwise direction, and wheel **310** to rotate counterclockwise on the track **304**. Wheel **306** will then follow and rotate to the exact same degree as wheel **310** on track **304**.

Simultaneously, cable **342**, which is connected to turnbuckle **350**, will move as shown by directional arrow BB of the page in FIG. 2. The function of turnbuckle **350** is to adjust the tension between cables **342** and **344**. The movement of cable **342** in the direction shown as BB then acts on cable **344** and subsequently drive chain **332** to move vertically upward as shown by directional arrow CC. The upward movement will then engage gear sprocket **324** and wheel **312** to also rotate simultaneously to the exact same degree as gear sprocket **326** and wheel **314**, in a counterclockwise direction on track **302**. Wheel **308** will then follow and rotate to the exact same degree as wheel **312** on track **302**.

The combine counterclockwise rotation of wheel **310** and **306** on track **304** and wheel **312** and **308** on track **302** will then account for the consequential movement of the entire automatic cover enclosure bench system **104** in one direction. as shown by directional arrows DD.

The description of the action of all the above-mentioned elements can be reversed by releasing hydraulic or pneumatic pressure from the port **358**. Rotation of gear sprocket **324** and **326** and wheel **310** and **312** is therefore clockwise on the track **302** and **304** respectively. Wheel **306** and **308** will then follow and have clockwise rotation on track **304** and **302** respectively. As a result, the cover enclosure bench system **104** will be moved backwards, in the opposite direction, as shown by directional arrows EE.

Travel of the cover enclosure bench system **104** can be automatically kept aligned and constrained by surfaces **330, 316, 314** and **328** on the bench making contact with floor mounted brackets **320** and **314** respectively which are sized appropriately for the correct length of travel **108** of bench **104**. Optionally, these surfaces **330, 316, 314** and **328** may be provided with contact sensors or motion detectors or relays or mechanical switches which transfer a control signal back to a power pack **202** or other controller, thereby controlling and delimiting forward and reverse motion of the bench.

The limited travel distance **108** on tracks **302** and **304** can be adjusted by changing the ratio between the diameter of gear sprockets **326** and **324** and wheels **306, 308, 310** and **312**. By reducing the diameter of gear sprockets **326** and **324** and/or increasing the diameter of wheels **306, 308, 310** and/or **312**, thereby increasing the ratio between the diameter of gear sprockets **326** and **324** and wheels **306, 308, 310** and/or **312**, the limited travel distance **108** may be increased or decreased, and vice versa.

As best shown in FIGS. 4 and 5, the whole system **104** is completely housed in the composite beam enclosure structure **402** as described in the inventor's previous U.S. Patent No. 5,927,042, which is hereby incorporated by reference in its entirety, or other suitable and appropriate swimming pool components and waterproof building materials. The system **104** is further powered by a power pack pump **202** that supplies the complete hydraulics to the automatic cover enclosure bench system **104**. In a

preferred embodiment, the power pack pump **202** is electrically powered and is connected to power source **404** via power cable and connectors **406**. The power pack pump **202** and its power source **404** are physically remote from the automatic cover enclosure bench system **104** and are connected by two hydraulic interchangeable supply and return lines **212**. This ensures that the electrical components are never located in the bench **104** or anywhere hear the edge **112** of the swimming pool **102**. The cylinder piston **356** and cylinder **206** moves the overall automatic cover enclosure bench system **104** within the range of the restricted travel distance **108**.

FIG. 5 shows a preferred embodiment of the automatic cover enclosure bench system **104** of the present invention with the top panel **408** (as best shown in FIG. 4) removed. The whole system **104** is built using the composite beam panels and enclosure structures **402** according to the inventor's previous U.S. Patent No. 5,927,042 entitled COMPOSITE BEAM STRUCTURE, or other suitable and appropriate building materials and construction designs..

Track **302** constrains the travel concave wheel surfaces of wheels **308** and **312**. Gear sprocket **324**, which has a slightly smaller diameter than wheel **312** so as not to interfere with the motion of the wheels **312** on the track **302**, is attached to wheel **312**. The diameter of wheels **312** and **308** are at a preset ratio to the length of travel of cylinder **206** so as to achieve the proper distance of travel **108** of the bench **104**. Around the circumference of gear sprocket **324** is section of the drive chain **332**. The drive chain **332** is designed to be sufficiently long to achieve the required travel. The ends of the drive chain **332** are suitably attached to cable **344**.

With top panel **408** removed, the inside view is shown. A central shaft **502** runs through the entire automatic cover enclosure bench system **104**. The central shaft **502** is secured at both right and left ends of the system **104** by a securing system **504**. The shaft **502** is part of a pool cover **101** drive roller

drum for swimming pool cover **101** operation. Such is described in the inventor's previous U.S. Patent No. 5,184,357 entitled AUTOMATIC SWIMMING POOL COVER WITH A DUAL HYDRAULIC DRIVE SYSTEM, and inventor's U.S. Patent No. 5,546,751 entitled ANTI-CAVITATION MANIFOLD FOR DRIVE COUPLED, DUAL MOTOR, REVERSIBLE HYDRAULIC DRIVE SYSTEMS, both of which are incorporated herein in their entireties, or any other similar swimming pool cover system.

As shown best in FIGS. 5 and 6, the central shaft **502** is secured at both right and left ends of the system **104** by a securing system **504** coupled to the side wall **506** Such securing system **504** would comprise a bearing pack or set of hubs, bearings and races, and be suitably clamped into the side wall **506** of the bench enclosure **104**.

As also shown best in FIGS. 5 and 6, track **302** constrains the travel of concave wheel surfaces of wheels **308** and **312**. Gear sprocket **324**, which has a slightly smaller diameter than wheel **312** so as not to interfere with the motion of the wheel **312** on the track **302**, is attached to wheel **312**. The diameter of wheels **312** and **308** are at a preset ratio to the length of travel of cylinder **206** so as to achieve the proper distance of travel **108** of the bench **104**. Around the circumference of gear sprocket **324** is section of the drive chain **332**. The drive chain **332** is designed to be sufficiently long to achieve the required travel. The ends of the drive chain **332** are suitably attached to cable **344**.

Thus, it will be understood that the hydraulic pump or power pack pump **202** can be located at a distal point from the bench **104** and have connection with the bench system **104** only by hydraulic fluid lines **212**. As described, the hydraulic fluid lines **212** can be connected directly to the fluid ports **358** and **360** of piston cylinder **106**. They can also be connected to a master hydraulic fluid valve/rotor cap/diverter valve assembly **420** which serves to distribute actuation of not only the lateral, back and forth pool-side positioning of the present bench system **104** on tracks **302** and **304**, but also optionally

opening and closing of one of the bench panel members, i.e., the top **408**, a side panel **402**, etc. as well as optionally driving the central drive shaft **502** of the cover **101** drum bench enclosure **104**.

In a preferred embodiment, the master hydraulic fluid valve/rotor cap/diverter valve assembly **420** causes actuation of the positioning assembly to cause the bench **104** to slide up to the edge **112** of the swimming pool **102** and back, and also to unfurl a cover, floating or not, which extends over the entire swimming pool. In a preferred method of use, the master hydraulic fluid valve/rotor cap/diverter valve assembly **420** actuates the cover drum enclosure **104** and positions it adjacent the edge **112** swimming pool **102**. Upon desired positioning, the master hydraulic fluid valve/rotor cap/diverter valve assembly **420** actuates the central shaft **502** of the cover **101** drum and unrolls the cover **101** over the top of the swimming pool **102**. When the swimming pool is in use, however, the pool cover **101** can first be rolled back up onto the drive shaft **502** and then the entire cover drum and bench enclosure **104** can be rolled backwards, away from the edge **112** of the swimming pool **102**.

It will be understood by those skilled in the art, based on the foregoing, that by changing the ratios and diameters of wheels and gears, the cover enclosure system **104** of the present invention can be moved out over the middle of the swimming pool **102** , as well as back over the edge **112** of the pool **102** and back away from the pool **102** as far as desired. The set of wheels and gears described herein are merely exemplary and not intended to be limiting in any way.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the present invention belongs. Although any methods and materials similar or equivalent to those described can be used in the practice or testing of the present invention, the preferred methods and materials are now described. All publications and patent documents referenced in the present invention are incorporated herein by

reference.

While the principles of the invention have been made clear in illustrative embodiments, there will be immediately obvious to those skilled in the art many modifications of structure, arrangement, proportions, the elements, materials, and components used in the practice of the invention, and otherwise, which are particularly adapted to specific environments and operative requirements without departing from those principles. The appended claims are intended to cover and embrace any and all such modifications, with the limits only of the true purview, spirit and scope of the invention.

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